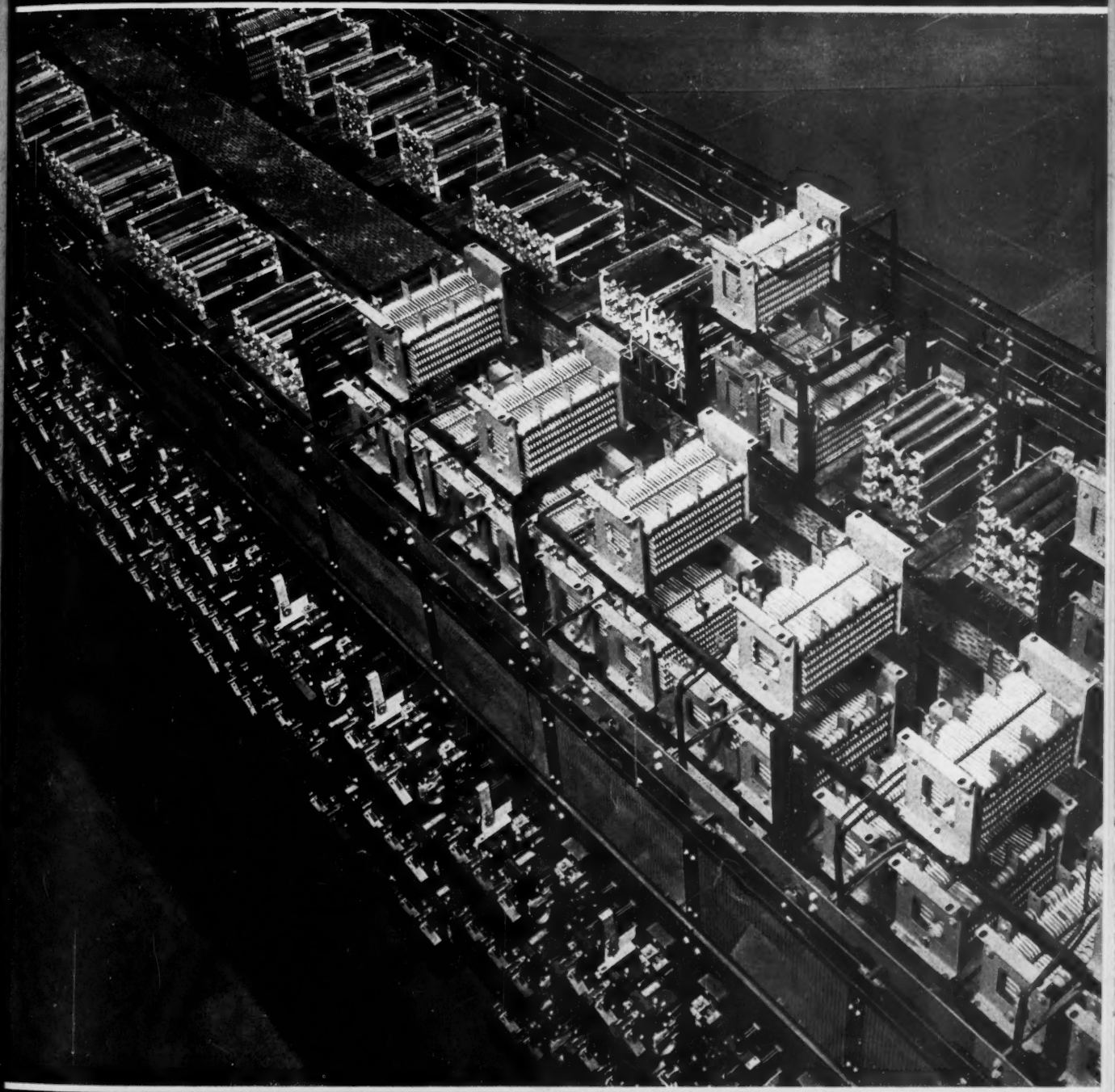
Industrial Standardization



May

New American Standard for Industrial Control Apparatus

(See Article on Page 97)

1944

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Industrial Standardization

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29 West 39th Street, New York 18, N. Y.

RUTH E. MASON, Editor

Our Front Cover: **An assembly of magnetic controllers used for the operation of the auxiliaries in a steel mill.** *Westinghouse Electric & Manufacturing Company.*

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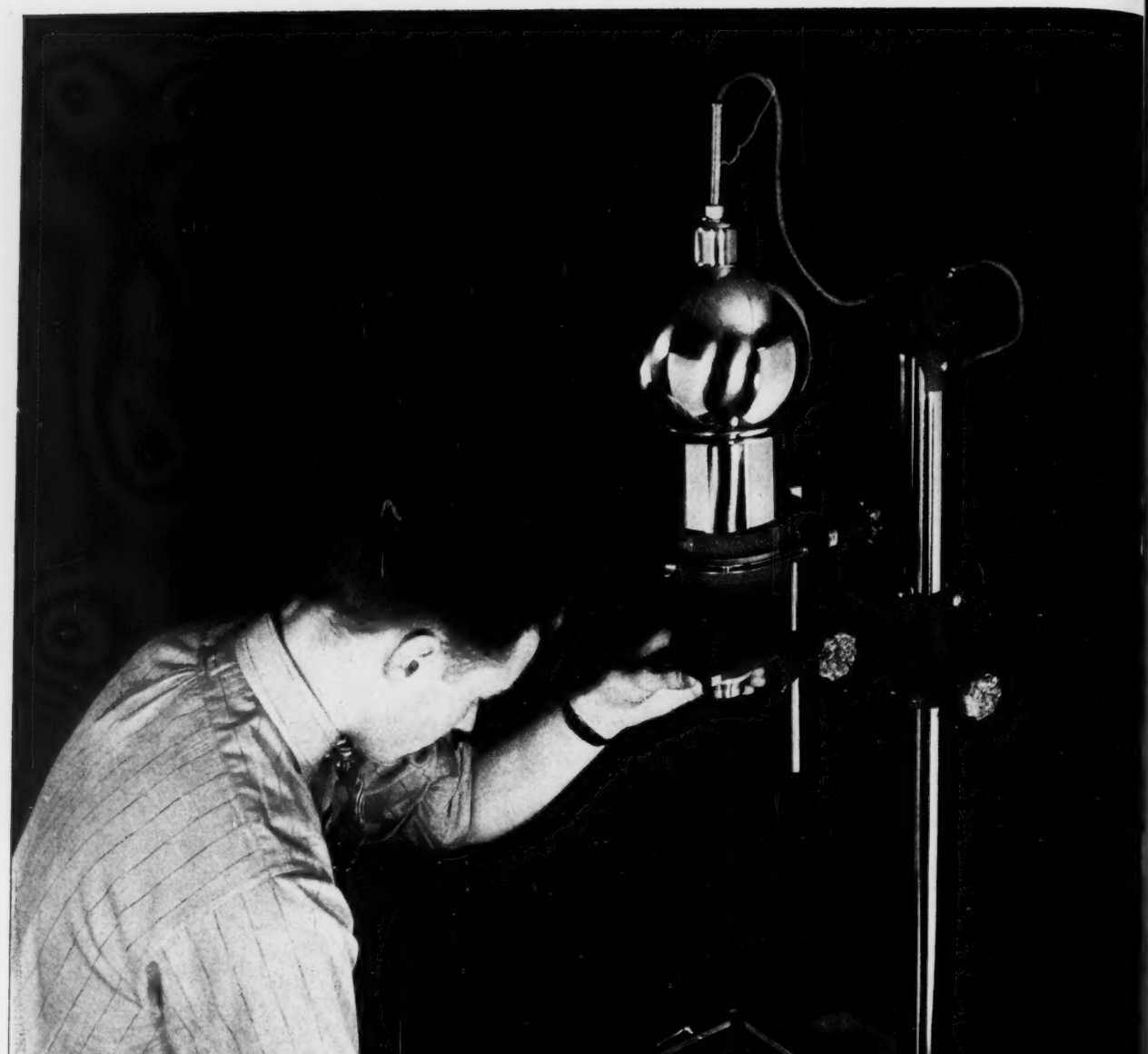


Uniformity of illumination is one of the tests for which a simple method is given in the new American Standard, Z38.7.5—1943. Here, a projection printer is in use.

How to Check Performance of Photographic Printing and Projection Equipment

by Oscar W. Richards[1]

Chairman, Subcommittee 7 on Printing and Projection Equipment, ASA Sectional Committee on Standardization in the Field of Photography, Z38

STANDARD methods of test are as important as dimensional standards in providing for efficient equipment, because they make it possible for different individuals and laboratories to carry out tests in such a way that the results can be compared without fear of variation in the methods used. The new American Standard, Methods of Testing Printing and Projection Equipment, Z38.7.5-1943, provides reasonably simple testing methods for three important aspects of the performance of photographic printing and projection equipment—uniformity of contact between negative and positive in printing equipment; temperature of the film or slide after the projector has been operated for one hour; and uniformity of the illumination of the screen. Because the equipment tested concerns ordinary, good equipment for amateur and professional use, rather than special equipment such as that used in photoengraving and photogrammetry, some of the tests are not as elaborate as would be necessary for the more precise equipment.

Requires Good Master Negative

The method of measuring uniformity of contact between negative and positive in printing equipment, as provided in the new standard, requires a good master negative, such as a print from the engraver's screen. The standard test provides for the use of a screen with 120 lines per inch, so arranged as to provide alternating clear and opaque regions of equal areas. A print is made from this master screen developed in the customary manner, and poor contact is shown by any departure from the uniform gray tone of the print. The tolerance limits for contact are stated in the American Standard for Contact Printers, Z38.7.10-1944. The master print is made on the same material, either plate or film, as will be used in the printer.

The temperature of a film or slide cannot be measured in a printer or in a projector with an ordinary thermometer. The thermometer is not of the proper shape for good contact, and a glass bulb does not absorb heat energy as would a film. The preferred method uses a thermocouple, of wire small enough so that good contact may be made with the material to be tested, and determines the rise in temperature by means of a suitable voltmeter or potentiometer. The standard test calls for a precision of ±2 C. A suitable thermocouple is either cemented to a film or slide having a density of 2.0 or greater, or is held in good contact with it, on the side away from the light.

Filmslide and lantern slide projectors, microfilm readers, and similar instruments warm up gradually

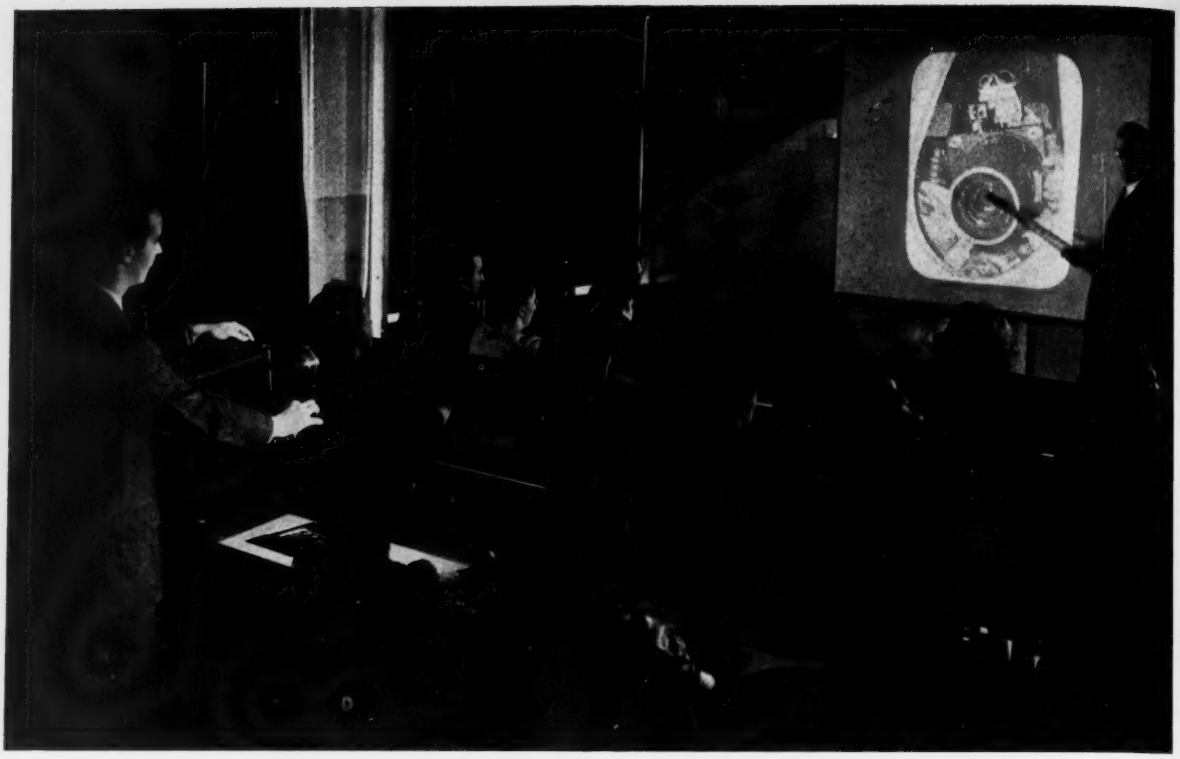
The American Standard, Methods of Testing Printing and Projection Equipment, Z38.7.5-1943, is one of a series of standards for photography (not including cinematography) which is being developed by a sectional committee under the sponsorship of the Optical Society of America. Under the procedure of the American Standards Association this sectional committee represents all the groups principally concerned with the subjects for which standards are being developed. Up to the present time, 25 standards for photographic film, paper, cameras and lenses, printing and projection equipment, and methods of determining photographic speed and for computing exposure have been completed through the work of this committee.

In addition, three proposed standards — on method of processing for sensitometry of photographic paper; practice for microfilms; and specifications for microfilm readers—have been issued for a period of trial and criticism.

A War Committee on Photography is now working on standards to help solve problems arising from the use of photographic equipment in war zones.

Copies of the American Standard Methods of Testing Printing and Projection Equipment, Z38.7.5-1943, are available at 10 cents each.

[1] Research Biologist, Spencer Lens Company, Buffalo, N. Y.



The new standard tells how to check the temperature of slides or film to prevent over-heating

until they reach an equilibrium temperature. In this case it is necessary that the test film be in place during operation for an hour; the temperature rise is measured at the end of the hour. Some equipment will reach equilibrium sooner, while other equipment will require an hour; consequently, measuring after an hour of operation will ordinarily give comparable results.

How to Test Uniformity of Illumination

Measuring the uniformity of illumination is difficult but very important. In order that measurements will be comparable with each other, the areas illuminated must be strictly comparable. Consequently, the testing method requires that the aperture be limited and focused to that which is standardized for the particular instrument to be tested, and that the larger dimension be magnified to a screen size of at least 40 inches. A precision of ±5 percent is required of the measuring equipment, and if photoelectric cells are used, it is required that they have an attached filter to correct their sensitivity approximately to that of the human eye. The problem of the image falling off at the corners of the screen is cared for by specifying where the measurements are to be made. The corner-to-center ratio is obtained from the average of the four corners with respect to the illumination at the center of the screen. The standard also provides directions for determining the lumen output.

With reasonable care, and some familiarity with the type of measuring equipment provided for in the standard, it should be possible to determine by means of these testing methods whether or not an item of photographic equipment meets the requirements of the standard. The subcommittee believes it has chosen measuring instruments which are generally available and which will give satisfactory results. Even so, the user must understand the use of the instruments, because the incorrect use of a good instrument may give incorrect and misleading information. The measuring equipment will show what is measured, but the importance of the information depends on the equipment to be measured. The tolerances and limits applying to contact and projection printers (enlargers), and slide and opaque projectors will be found in the several proposed standards now being completed by committees of the American Standards Association. These proposed standards include Specifications for Contact Printers, Z38.7.10; Specifications for Printing Frames, Z38.7.11; Specifications for Masks (Separate), Z38.7.12; Dimensions for Lantern Slides, Z38.7.13; Specifications for Lantern Slide Projectors, Z38.7.14; Specifications for Projectors for Opaque Materials for Use in Small Auditoriums, Z38.7.4; and Practice for Temperature of Processing Solutions, Z38.8.1. All these proposed standards are now nearing completion and it is expected that they will be available as approved American Standards within the next few months.

Argentine Committee Translates IEC Documents

With the translation of all the standards approved by the International Electrotechnical Commission as a goal, the Argentine National Committee of the IEC (the Comité Electrotécnico Argentino) has now made available in Spanish the following documents closely related to standards:

Recomendaciones de la CEI (Comision Electrotecnica Internacional) concernientes a la normalización del sentido de movimiento de aparatos de maniobra y de lámparas indicadoras para interruptores Publicacion No. 19 Septiembre de 1942

Estado de los trabajos del Comité Electrotécnico Argentino Publicacion No. 20 Diciembre de 1942

Revision Correlates
AIEE and NEMA Standards On Industrial Control Apparatus

by William Seubert[1]

Chairman, Sectional Committee on Industrial Control Apparatus, C19

INFORMATION contained in two important standards of the electrical industry has now been correlated with the completion of a revised edition of the American Standard for Industrial Control Equipment, now C19.1-1943, AIEE No. 15-1944. The revision, which was prepared by a sectional committee under the joint sponsorship of the American Institute of Electrical Engineers and the National Electrical Manufacturers Association, consisted largely in correlating pertinent information in the old AIEE Standard No. 15 (American Standard C19-1928) and the new NEMA Industrial Control Standards published in 1937.

Gives Practical Information

The new American Standard is a reference work of practical information concerning the manufacture, test, and performance of industrial control equipment. Representing, as it does, standardized practice in the United States, it assists in harmonizing practices in the industry, promotes production economies, and consequently benefits users of electric motors and control equipment. It covers industrial motor control, similar control used for industrial heating, and rheostats, including those for the generator field. The control apparatus conforming to the standard must be suitable for carrying its rated load when and where the temperature of the cooling medium does not exceed 40 C, and where the altitude does not exceed 6,000 feet. For operation in altitudes above 6,000 feet and not exceeding 15,000 feet, provision is made for derating the apparatus. Sections in the standard cover resistors, ratings, specifications for products, and performance.

Standardization of industrial control equipment has had a long history. It was started by the Electric Power Club in 1916. The committee at that time consisted of W. C. Yates, Commercial Engineer of the Industrial Control Department, General Electric Company; T. E. Barnum, chief engineer of Cutler-Hammer, Inc; and H. D. James, engineer, Industrial Control Department of the Westinghouse Electric and Manufacturing Company. When a sectional committee was organized to include representation of all groups concerned and to qualify the standard for approval as American Standard, it was sponsored by the American Institute of Electrical Engineers, the Electric Power Club, and the National Electrical Manufacturers Association. Mr. James was chairman of this sectional committee, C19, and Mr. Barnum and Mr. Yates represented the Electric Power Club. Two other active and helpful members of the sectional committee were R. B. Shepard of Underwriters' Laboratories, Inc, and Dr. M. G. Lloyd of the National Bureau of Standards.

The task of revising the American Standard for Industrial Control Equipment, C19.1-1928, was started

A representative committee prepared the revision of the American Standard Industrial Control Apparatus (C19.1-1943). Members of the committee are:

William Seubert, National Electrical Manufacturers Association, *Chairman*

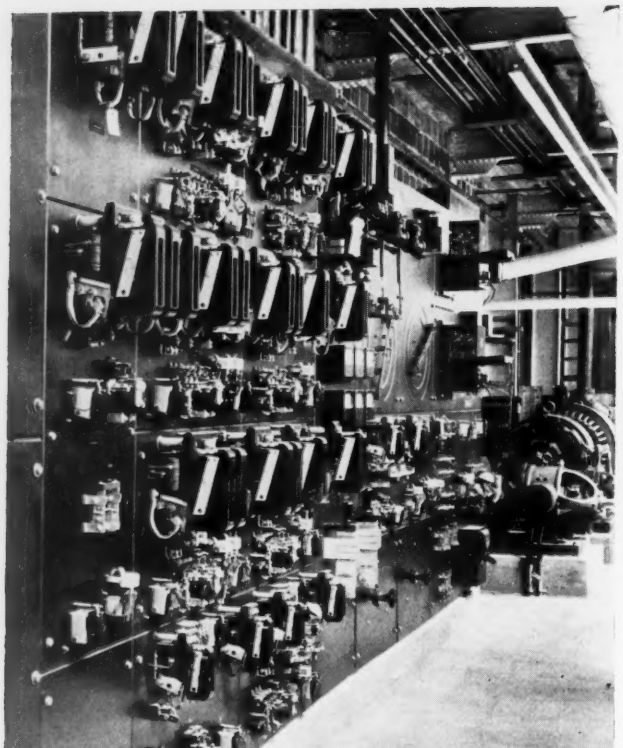
Frank P. Anderson, National Electrical Manufacturers Association, *Secretary*

American Institute of Electrical Engineers, *P. B. Harwood; W. I. Slichter; Gordon Thompson*
Association of Iron and Steel Engineers, *F. O. Schnure*
Electric Light and Power Group, *Oscar Bauhan; C. A. Harrington; H. E. Kent (Alternate)*
National Electrical Manufacturers Association, *W. J. Fleming; G. H. Garcelon; William Seubert*
National Machine Tool Builders' Association, *L. Michelson*
Underwriters' Laboratories Inc, *R. B. Shepard*
U. S. Navy Department, Bureau of Ships
U. S. War Department, *William L. Bach*

This committee worked under the joint sponsorship of the American Institute of Electrical Engineers and the National Electrical Manufacturers Association.

Copies of the standard may be obtained from the American Standards Association at 50 cents each.

[1] Arrow-Hart & Hegeman Electric Company, Hartford, Conn.



This apparatus controls a sectional drive operating a paper-making machine.

in November, 1937, by the American Institute of Electrical Engineers and the National Electrical Manufacturers Association as joint sponsors. A new sectional committee was appointed to carry on the work, and the first draft of the proposed revision was drawn up by a small task committee and submitted for comments to the sectional committee at a meeting June 17, 1938. As a result of the discussion at this meeting, a second draft was prepared and reviewed by the committee. Third and fourth drafts were subsequently prepared following further comments from committee members. The fourth draft received unanimous approval of the committee on May 24, 1943, and was then submitted by the joint sponsors to the American Standards Association August 9, 1943. Approval by the American Standards Association was announced on December 16, 1943.

Committee Cooperation Appreciated

Acknowledgment is hereby made to the members of the committee for their wholehearted cooperation in carrying out this work to a satisfactory conclusion. Particular thanks are made for the valuable assistance given by Captain F. P. Anderson, U. S. Army, who in 1937 was a member of the NEMA staff and acted as secretary of the committee.

Chemists' Association New Members of Safety Code Correlating Committee

The Manufacturing Chemists' Association has officially become a member of the Safety Code Correlating Committee of the ASA. The Association is composed of a group of chemical manufacturing companies throughout the country, which among other problems of special interest to the chemical industry, are interested in combatting industrial hazards and keeping down the accident rate. Since 1931, the Association has served on seven different ASA committees. Among these are sectional committees on: mechanical refrigeration; ventilation; exhaust systems; and allowable concentrations of toxic dusts and gases. Harold L. Miner of E. I. DuPont de Nemours & Company, Inc, represents the group on the SCCC as he does the National Fire Prevention Association.

What SCCC Membership Means

As a member of the Safety Code Correlating Committee, the Manufacturing Chemists' Association will have a voice in the supervision of the development and completion of safety standards in many different fields, in the approval of personnel on the committees which develop these standards, and the making of recommendations to the Standards Council in regard to the approval of safety standards. The committee studies existing standards in various fields and recommends projects to the sectional committees, passes on their scopes, and reviews the finished standard.

There are to date 115 safety standards which cover a wide variety of subjects. These include safety codes for elevators; woodworking; jacks; dust explosions; concentrations of toxic dusts and gases; safety shoes; and also the compiling of industrial accident statistics.

Members of the SCCC

Organizations holding membership in the Safety Code Correlating Committee are as follows:

American Gas Association
American Industrial Hygiene Association
American Iron and Steel Institute
American Petroleum Institute
American Society of Mechanical Engineers
American Transit Association
Association of American Railroads
Automobile Manufacturers Association
Conference of State and Provincial Health Authorities of North America
Electric Light and Power Group
Federal Security Agency, Public Health Service
Industrial Safety Equipment Association
International Association of Governmental Labor Officials
International Association of Industrial Accident Boards and Commissions
Manufacturing Chemists' Association
National Association of Mutual Casualty Companies
National Bureau of Standards
National Conservation Bureau
National Electrical Manufacturers Association
National Fire Protection Association
National Safety Council
Telephone Group
U. S. Department of Labor
U. S. Department of Labor, Bureau of Labor Statistics
U. S. Department of Labor, Division of Labor Standards.

Coordination of Electrical Graphical Symbols

by W. L. Heard[1]

Vice-chairman and Secretary of Committee on Graphical Symbols for Use on Drawings, Z32

DURING the past 50 years two large fields of endeavor have gradually grown up in the electrical industry more or less independently of each other. One of these has to do with the transmission of messages, electrically, and is known as "Communication"; the other has to do with the transmission, distribution, and use of electrical energy, and is known as "Power and Control."

Until recently these fields have had very little in common and their efforts have overlapped only to a minor degree. In the last few years, however, the use of electronic devices has greatly expanded. Especially accelerated by World War II has been the development of such equipment as detection devices, electronically controlled equipment, and other similar new apparatus. As a result, the two fields have recently begun to overlap and interlace, particularly in the aircraft industry. One effect of this interlacing has been felt in the use of common sets of drawings for design, manufacturing, and maintenance purposes in this particular industry.

Power and Communication Used Own Symbols

In the past, both the communications and the power and control branches of the electrical industry had developed and used graphical symbols adapted specifically to their individual field of endeavor to depict electrical devices on drawings. This was possible because the use to which these devices were put in the communications field was in many cases different from the use to which they were put in the power and control field. Although at times the same apparatus was used in both fields, it was not necessary in one field to depict details which in the other field might be essential. For example, in power distribution, there is no need of indicating the polarity of relays (contactors) to prevent electrical interference between circuits, whereas in communication it is vitally important that relays (contactors) are properly poled in order to prevent crosstalk or electrical interference between voice circuits.

With the advent of the present war, however, the Armed Forces began to feel the need of further standardization of electrical symbols due to the fact that they were receiving drawings from these two fields on which identical symbols in different circuits depicted entirely different devices. Faced with the effort of training large numbers of new technicians, the Armed Services have found the lack of uniformity in the drawings from the two fields of endeavor a very serious problem.

Different Drawings for Same Apparatus

This problem has also faced various portions of the electrical industry, which have found themselves manufacturing the same basic equipment but required to furnish different drawings of the types customary in the two branches of the electrical industry. In addition, industries using electrical and electronic components, such as the aircraft industry, have found that drawings for the same apparatus but furnished by different manufacturers have been quite different.

With both the Armed Forces and industry in agreement, the problem of conflicting symbols was one which had to be solved quickly. Two American Standards were already in existence, one on Graphical Symbols for Power, Control, and Measurement, Z32.3-1943, and the other on Graphical Symbols for Telephone, Telegraph, and Radio Use, Z32.5-1942. In order to resolve the conflict between these two standards, various groups in both government and industry undertook to present their own solutions. Conversations were held between officers of the ASA committees on graphical symbols, representatives of the National Aircraft Standards Committee, of the Aeronautical Board, and of the Signal Corps Standards Agency. These conversations resulted in a request to the American Standards Association for the initiation of a war project with the object of eliminating as far as possible all conflicts, and producing a set of symbols as nearly universal as possible. The conflicting symbols which were causing the most trouble are shown in the illustration (page 91).

War Standard Started

After consideration and recommendation, the chairman of the ASA Standards Council authorized the initiation of a War Standard project on December 31, 1943. A conference was held in New York on February 22, 1944, to which were invited representatives of technical societies, trade associations, the War and Navy Departments, the Aeronautical Board, National Aircraft Standards Committee, and a number of industrial organizations. At this conference a draft

[1] Systems Staff Engineer, Bell Telephone Laboratories, New York.

1. Capacitor

1.1 Fixed

2.1 Variable or Adjustable

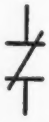
NOTE: Where it is necessary to identify the capacitor electrodes, the curved element shall represent the outside electrode in fixed paper-dielectric and ceramic-dielectric capacitors, the negative electrode in electrolytic capacitors, and the movable element in variable and adjustable capacitors. When it is desired especially to distinguish trimmer capacitors, the letter T should appear adjacent to the symbol.

2. Contact

2.1 Simple

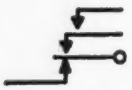
Open

Closed



NOTE: The line representing contacts shall be approximately equal to 1¼ times the width of the gap between the lines.

2.2 Simple or Sequence



NOTE: The symbol for sequence contact may also be used for a simple contact in order to maintain uniformity and avoid confusion on drawings.

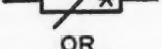
3. Resistor (Including Rheostat and Voltage Divider)

3.1 Fixed

Simple:

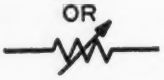
OR

Detailed:



3.2 Variable or Adjustable

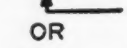
Simple:



OR

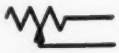
Detailed:

Simple:



OR

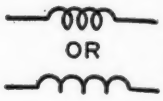
Detailed:



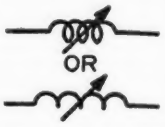
* NOTE: This symbol must always be used with an identifying legend within or adjacent to the rectangle.

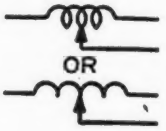
4. Inductor

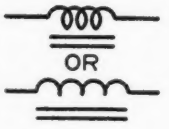
4.1 Fixed



4.2 Variable or Adjustable

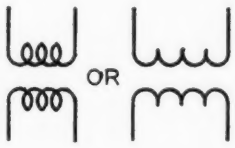






NOTE: When it is desired especially to distinguish magnetic core inductors, a line or lines parallel to the axis of the loops should be used.

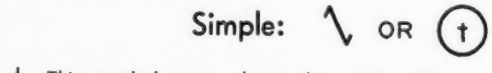
5. Transformer



NOTE: When it is desired especially to distinguish magnetic core transformers, a line or lines parallel to the axis of the loops should be used.

6. Operating Coil

Simple:

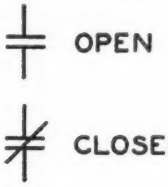
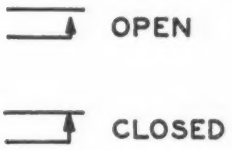
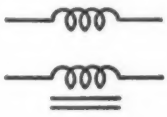


† This symbol must always be used with an identifying legend within or adjacent to the circle.

Detailed:†

NOTE: This symbol is customarily used with sequence contacts.

Electrical graphical symbols on which all groups have agreed in the new American War Standard Coordination of Electrical Graphical Symbols for Use on Drawings, Z32.11-1944.

NAME	POWER	COMMUNICATIONS
CONTACT	 OPEN CLOSED	 OPEN CLOSED
RESISTOR		
COIL AIR CORE IRON CORE		
CAPACITOR		

Conflicting symbols which caused the most trouble before coordination.

of a proposed standard was agreed upon to supplement the present standards (Graphical Symbols for Power, Control and Measurement, Z32.3-1943, and Graphical Symbols for Telephone, Telegraph, and Radio Use, Z32.5-1942). This draft was circulated for acceptance or comment to interested organizations, groups, and individuals. As a result of this circulation certain comments were received which were considered at a second conference held in New York on March 2, 1944. To this second conference were invited also the members of the Subgroups on Communications and on Power and Control Symbols of the Sectional Committee on Graphical Symbols, Z32, which were responsible for the existing standards. After consideration of all points concerned, a compromise group of symbols was unanimously recommended by this conference for use on electrical circuits.

It was the opinion of the conference that the proposed coordination efforts afford a practical solution to a perplexing and long-standing problem which has caused much confusion within both industry and the Armed Forces in the design, manufacture, and maintenance of electrical equipment. Some alternate symbols are still permitted by the standard where the usage is different in different fields, or where the use of a symbol is deep-seated in the industry and to change at this time would cause undue hardship. It was not felt, however, that this would cause any undue trouble to those compelled to read drawings from more than one field, as all conflicts have been entirely eliminated.

The proposed coordination of the electrical symbols recommended by the conference was approved as American War Standard Coordination of Electrical Graphical Symbols, Z32.11-1944, by the chairman of the Standards Council on April 18, 1944, following a unanimous recommendation by the Board of Examination.

Consideration is now being given to the revision of the present American Standard Graphical Symbols for Power, Control and Measurement, Z32.3-1943 and American Standard Graphical Symbols for Telephone, Telegraph, and Radio Use, Z32.5-1942 to bring them into conformity with the newly approved War Standard. The present daily increase in the use of electronics in the electrical industry makes this final coordination a peacetime necessity, it is believed.

Inasmuch as standardization is a slow process, it is felt that the results which have been accomplished through this coordination have brought the standardization of electrical symbols a long way toward the ultimate goal of one complete set of symbols. It is hoped that further standardization can be accomplished as use of the coordinated symbols is increased.

NFPA Plans 1945 Revision of National Electrical Code

The 1945 edition of the National Electrical Code is now being planned by the sponsor, the National Fire Protection Association. Due to the war, the 1943 revision of the Code was not made and the 1940 edition has remained intact.

Since 1941, however, the Electrical Committee has had an emergency committee working on interim revisions to take care of changes arising from the national emergency. Two of the principal causes for these changes have been lack of strategic material and War Production Board orders restricting the use of essential material.

The committee has asked for suggested revisions to the code. These should be received by them not later than September 30, 1944. A meeting will be held the following May in Chicago.

ASA Planning Post-War Program

WHAT position should the American Standards Association hold in the nation's post-war economy? What should be done now to bring its methods and policies into line with such a post-war program? These are questions that two ASA Post-War Planning Committees are now studying—one appointed by the Board to deal with the more general questions; the other appointed by the Standards Council to consider the post-war work of the Council itself.

These committees have been meeting over a period of several months. Recommendations resulting from their studies were discussed at an all-day conference between committee members and Member-Body representatives May 5. Modified progress reports were fully discussed at a meeting of the Standards Council on May 18.

As a result of all these discussions the Board has taken several actions based upon the consequent recommendations.

The most important of these actions is one for the enlargement of the scope of the Association's activities by removing the present restrictions in the ASA constitution which limit the work of the ASA to the engineering field. One of the principal reasons for this action is "the growing importance of standards for consumer goods." The view was that the ASA should be so organized that it can handle any standard or standardization project which deserves national recognition —whether in the field of engineering, accounting, business practice, or consumer goods. Since this requires a constitutional change it will have to be ratified by the Member-Bodies.

In connection with these plans, a special study is being made of the whole subject of labeling and certification by a committee of the Board as a basis for future policy. Members of this committee are: Howard Coonley, War Production Board, *Chairman;* Dr. Lyman J. Briggs, Director, National Bureau of Standards; J. R. Allen, Chairman, Landers, Frary and Clark.

International Standardization Studied

Special attention is being given to international standardization, and an effort is being made to bring about a better organization of international standardization work than has hitherto existed. The Board has authorized appointment of a special committee to make a study of the interests of the country in international standardization and of the arrangements which the ASA should make in order to render the best service possible within its means.

The affiliation of the ASA with the United Nations Standards Committee was confirmed, including financial support for a period of two years.

An interim step toward broadening membership and strengthening support of the Association was taken by authorizing additions to the staff for this purpose.

The Board also decided that the pages of INDUSTRIAL STANDARDIZATION should be open to advertising under suitable regulations.

Members of Planning Committees

Members of the Planning Committees, which are continuing work toward completion of final reports, are:

Board of Directors—

H. B. Bryans, President, American Standards Association, representing ASA Electric Light and Power Group, *Chairman*
Lyman J. Briggs, National Bureau of Standards
C. L. Collens, National Electrical Manufacturers Association
Howard Coonley, Manufacturers Standardization Society of the Valve and Fittings Industry
Clifton E. Mack, U. S. Treasury Department
H. S. Osborne, American Telephone & Telegraph Company; Chairman ASA Standards Council
R. E. Zimmerman, vice-president, U. S. Steel Corporation; Past-president American Standards Association

Standards Council—

R. L. Jones, ASA Telephone Group, *Chairman*
L. F. Adams, National Electrical Manufacturers Association
E. C. Crittenden, National Bureau of Standards, U. S. Department of Commerce
Arthur S. Johnson, National Association of Mutual Casualty Companies
Clifton E. Mack, U. S. Treasury Department
H. H. Morgan, American Society for Testing Materials
Alvah Small, ASA Fire Protection Group

The importance of the post-war planning work was summarized by Henry B. Bryans, president of the American Standards Association, at a special conference with Member-Bodies May 5. Mr. Bryans said:

"The country is today far more standards-conscious than ever before. Hundreds, if not thousands, of companies have had to produce to Army and Navy specifications for the first time. Standards have been debated on the floors of Congress, and have been the subject of controversy between the President and Congress. The great labor organizations are interesting themselves in standards as controls in holding down living costs.

"For years ASA work has been slowly coming into more intimate contact with the Government—Federal—State—Municipal. The war has speeded this up—especially in our relations to the Federal Government, and still more particularly with the Army, Navy, and the War Agencies. These relationships will be much more important in post-war years.

"It seems to be the universal opinion that the international aspect of standardization will be far more important in the future than in the past. One reason is greatly improved communications. The ASA is already taking two important steps—in joining with the other national bodies in organizing the United Nations Standards Coordinating Committee; and in developing the Inter-American work.

"For these, and for many other reasons, we should take stock and plan for tomorrow.

"I hope that we can deal mainly with the functions that the ASA should perform: how it should organize and continue its operations so that it may successfully fulfill those functions."

The Board committee is continuing its work on plans for strengthening finances and staff facilities, on possible reorganization of the Advisory Committee of industrial executives, and policy on labeling and certification.

The Board and the Council will welcome suggestions from any source for making the ASA more useful.

New Graphical Symbols Depict Electronic Devices

by W. L. Heard[1]

Chairman, Subgroup on Electronic Symbols, ASA Sectional Committee on Graphical Symbols and Abbreviations for Use on Drawings

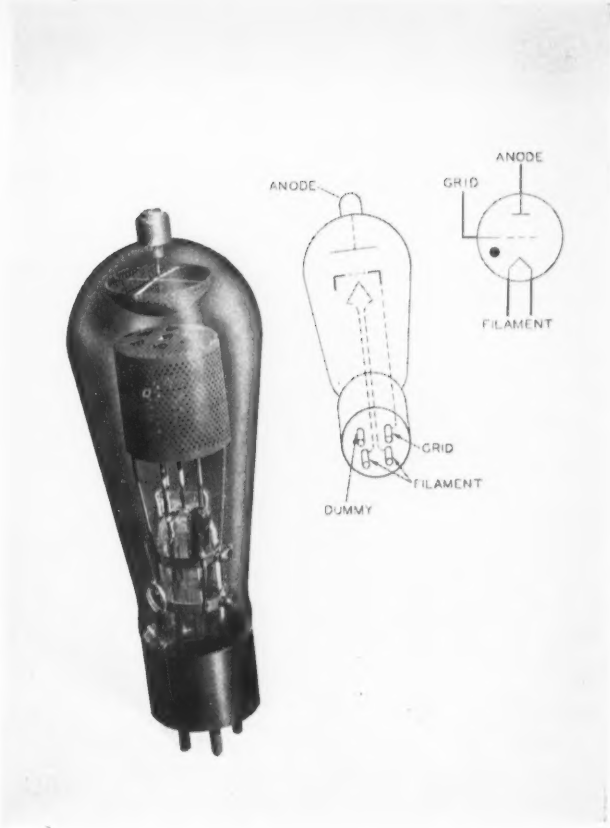
THE use of apparatus known as electronic devices or vacuum tubes has increased to such a degree since the last war that it has now been found necessary to standardize and coordinate the graphical symbols used for depicting these devices on drawings.

Prior to 1918 there were only a few vacuum tubes in use and these were of a simple type, usually three elements, which could be easily depicted since they consisted only of a glass envelope in which was enclosed a filament, a plate, and a control grid. Now, however, electronic devices are found in almost every field where electric currents are used and controlled. This is due to the fact that they are being applied in new fields, such as in welding control, and also to the fact that the demands of the Armed Forces, particularly for communication and electrical detecting devices, have accelerated their use to an unheard of degree. Even in civilian life, four or more types of tubes will now be found in every home radio receiver; and, in manufacturing processes, electronic devices are found in many types of control equipment. All branches of the Armed Forces are using huge quantities in the war effort.

Complicated Devices—More Complicated Symbols

As a result of this rapid expansion in their use, electronic devices have become so complicated in structure that simple picturization on drawings is no longer feasible. For this reason, a new standard showing the graphical symbols agreed upon for picturing electronic devices on drawings has just been completed by a committee working under the leadership of the American Institute of Electrical Engineers and the American Society of Mechanical Engineers. It has been approved as American Standard. In preparing the new standard the graphical symbols for electronic devices have been made a study in themselves, for although they are always used as a part of a power or communication circuit drawing, the devices are of a nature which place them in a class by themselves.

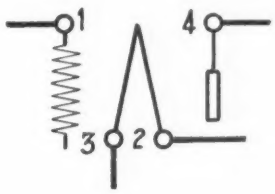
[1] Systems Staff Engineer, Bell Telephone Laboratories, New York.



An electron tube, diagram of its construction, and the graphical symbol (in upper corner) for the tube and its parts.

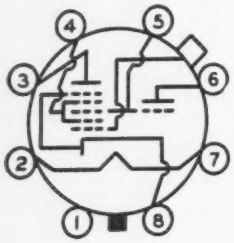
Early Symbols for Vacuum Tubes Show Need for Clarification and Standardization

For a number of years, radio and telephone circuits used simple vacuum tubes for amplification and detection purposes.



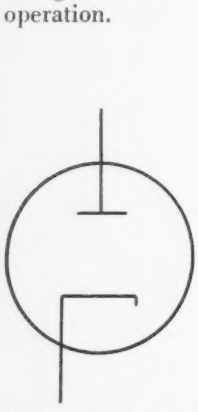
The figure above shows a typical picturization of an amplifier tube in operation in a telephone repeater circuit as of about 1916. In this symbol the grid is represented by the resistor symbol. This is because the grid was supposed to depict the resistance to the flow of electrons from the cathode to the plate, the cathode in these tubes being of the simple filament type and the plate being a simple surface. At that time it was not even felt necessary to show the envelope of the tube. However, as the tubes became more complicated it became necessary to simplify the representation of the elements, because with these complicated devices there were often four or five grids and one or more cathodes and plates. Also, in many tubes the heater element

became a separate unit from the cathode. For example, a triode-heptode with rigid envelope connections and basing information becomes quite a complicated diagram of connections when all this information is shown in the diagram.

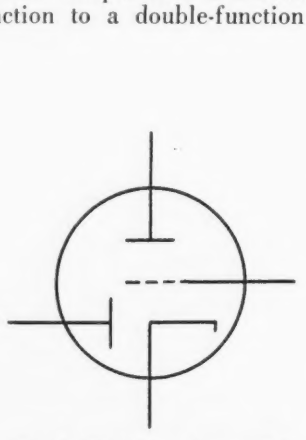


Triode-Heptode with Rigid Envelope Connection and Basing Terminals

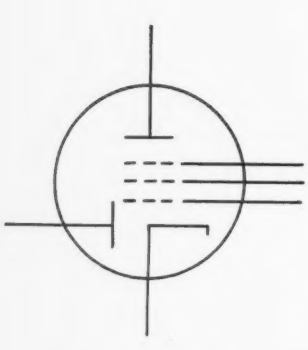
Even the simple two-element diode detector has become quite complicated in its present-day usage. For example, this is true where the simple tube has been changed from a single-function to a double-function operation.



Diode Used in Simplets Detector Circuit



Diode-Triode where Triode Amplification Has Been Added to the Tube



Diode-Pentode where Pentode Amplification Has Been Added to the Tube

Types of Tubes and Uses to Which They Are Put

Some of the extended uses to which electronic devices are now put, other than the commonly thought of radio and telephone usage, are described to some extent in the following:

(*a*) More and more the electrical field is making use of ultra-high-frequency. However, in order to generate these currents it has been found that the present conventional type of tube with plate, grid, and cathode could not be used, and it has been necessary to design special tubes to produce the wave lengths required with these currents. Such tubes as magnetrons, velocity-modulation tubes, and other similar types, have been developed for such uses.

(*b*) It has been found in a-c welding that it is necessary to provide automatic voltage controls in order to maintain proper voltages to produce uniform heat for consistent welding. This is being done by means of controls which use electron tubes.

(*c*) The use of carrier current is being extended to apply it to power lines, which means a wider use of electron tubes in conjunction with regular power-distribution systems.

(*d*) A multitude of miscellaneous uses for tubes are found in such things as X-rays, oscillographs, oscilloscopes, various testing devices, current-rectifying circuits, and in automatic types of circuits such as air-raid alarm warnings, etc.

Basis of the Design and Use of Electronic Symbols

The American Standard for Graphical Symbols for Electronic Devices, Z32.10-1944, was developed to cover the graphical symbols used for devices known as electron tubes. In the standard the symbols for the tube components are first given. These are followed by typical applications showing the use of these component symbols in various classes of devices such as the thermionic, cold cathode, and photo-emissive devices of varying structures and combinations of elements such as triodes, pentodes, cathode-ray tubes, magnetrons, velocity-modulation tubes, etc.

To formulate a symbol for any specific tube, the components are selected from the list shown or are made by the creation, or the assembling, of component symbols in the manner shown. For instance, depicts a cold cathode electrode, while depicts a collecting electrode or plate.

depicts an envelope or shell. By combining these we have a diode (cold-cathode).

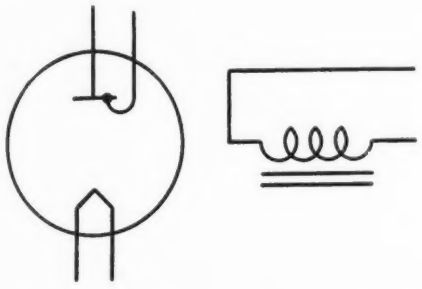
If we wish to show that this is a gas-filled tube we add a dot within the shell indicating a gas-filled envelope.

Diode (Cold-Cathode Gas Content)

Symbols Indicate Electrical Functions

The symbols for electronic devices are intended primarily to indicate only electrical functions, although their respective physical pattern may be indicated in some cases, such as is done where basing diagrams are required. In general, however, the component parts of each symbol depicting a piece of apparatus have been shown in physical relation as far as possible without undue complication of the symbol or drawing. Exceptions may be made to this, of course, where a definite

position must be maintained to identify or associate the symbol with other apparatus as is necessary with magnetrons and their associated coils.



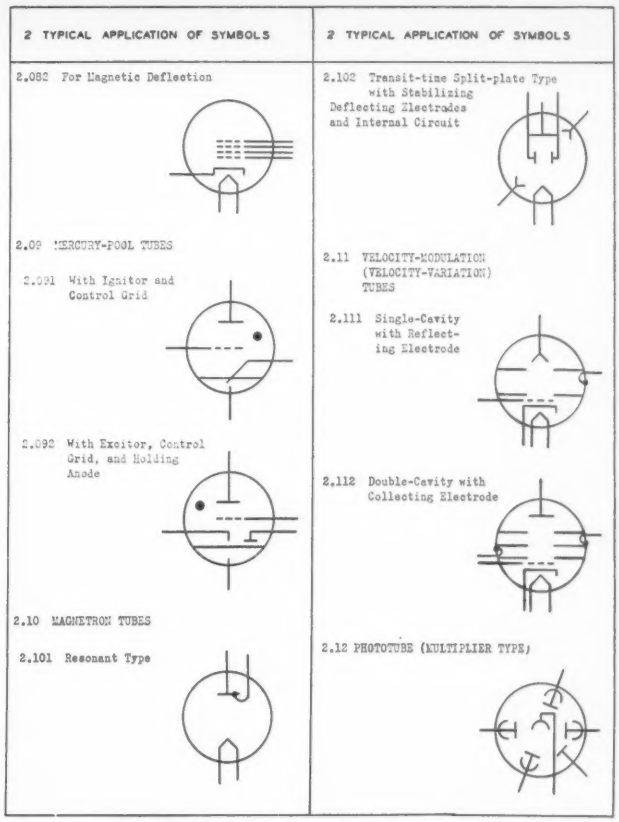
Symbol for Resonant-Type Magnetron Plus Symbol for Ferro-magnetic Inductor

Symbol sizes and line widths as depicted in the standard have been designed for average drawing use, and, when reduced two to one, result in sizes which seem most desirable for publication purposes. The size and width of lines, however, may be altered as required, although it is believed that the sizes shown in the standard are the best possible for general usage. Wires need not be brought into the symbol in any particular position but may be varied as required to simplify the wiring pattern in any particular circuit drawing.

How This Work Was Accomplished

The work on these new American Standard graphical symbols was accomplished under the leadership of H. W. Samson, chairman of the ASA Sectional Committee on Standardization of Graphical Symbols for Use on Drawings, Z32, which has been functioning for some time. To this committee was given the work of standardizing all symbols to be used on circuit drawings. The actual work of standardizing the electronic-device symbols was under the direction of a subcommittee known as Subgroup 7 on Electronic Symbols. The membership of this subcommittee was as follows:

W. L. Heard, *Chairman*
W. A. Bischoff, Telephone Group
R. S. Burnap, American Institute of Electrical Engineers and Radio Corporation of America
J. J. Grabeic, Sperry Gyroscope Company
L. C. F. Horle, Radio Manufacturers Association
H. L. Palmer, National Electrical Manufacturers Association and General Electric Company
A. C. Rockwood, Radio Manufacturers Association and Raytheon Production Corporation
T. Spooner, Westinghouse Electric and Manufacturing Company
V. E. Trouant, RCA Victor Division, Radio Corporation of America
H. P. Westman, Institute of Radio Engineers


2 TYPICAL APPLICATION OF SYMBOLS
2.082 For Magnetic Deflection
2.09 MERCURY-POOL TUBES
2.091 With Ignitor and Control Grid
2.092 With Exciter, Control Grid, and Holding Anode
2.10 MAGNETRON TUBES
2.101 Resonant Type
2 TYPICAL APPLICATION OF SYMBOLS
2.102 Transit-time Split-plate Type with Stabilizing Deflecting Electrodes and Internal Circuit
2.11 VELOCITY-MODULATION (VELOCITY-VARIATION) TUBES
2.111 Single-Cavity with Reflecting Electrode
2.112 Double-Cavity with Collecting Electrode
2.12 PHOTOTUBE (MULTIPLIER TYPE)

A Page from the New American Standard

The American Standard for Graphical Symbols for Electronic Devices, Z32.10-1944, prepared under the sponsorship of the American Institute of Electrical Engineers and the American Society of Mechanical Engineers, is now available at 20 cents per copy. Other American Standards for graphical symbols include the following:

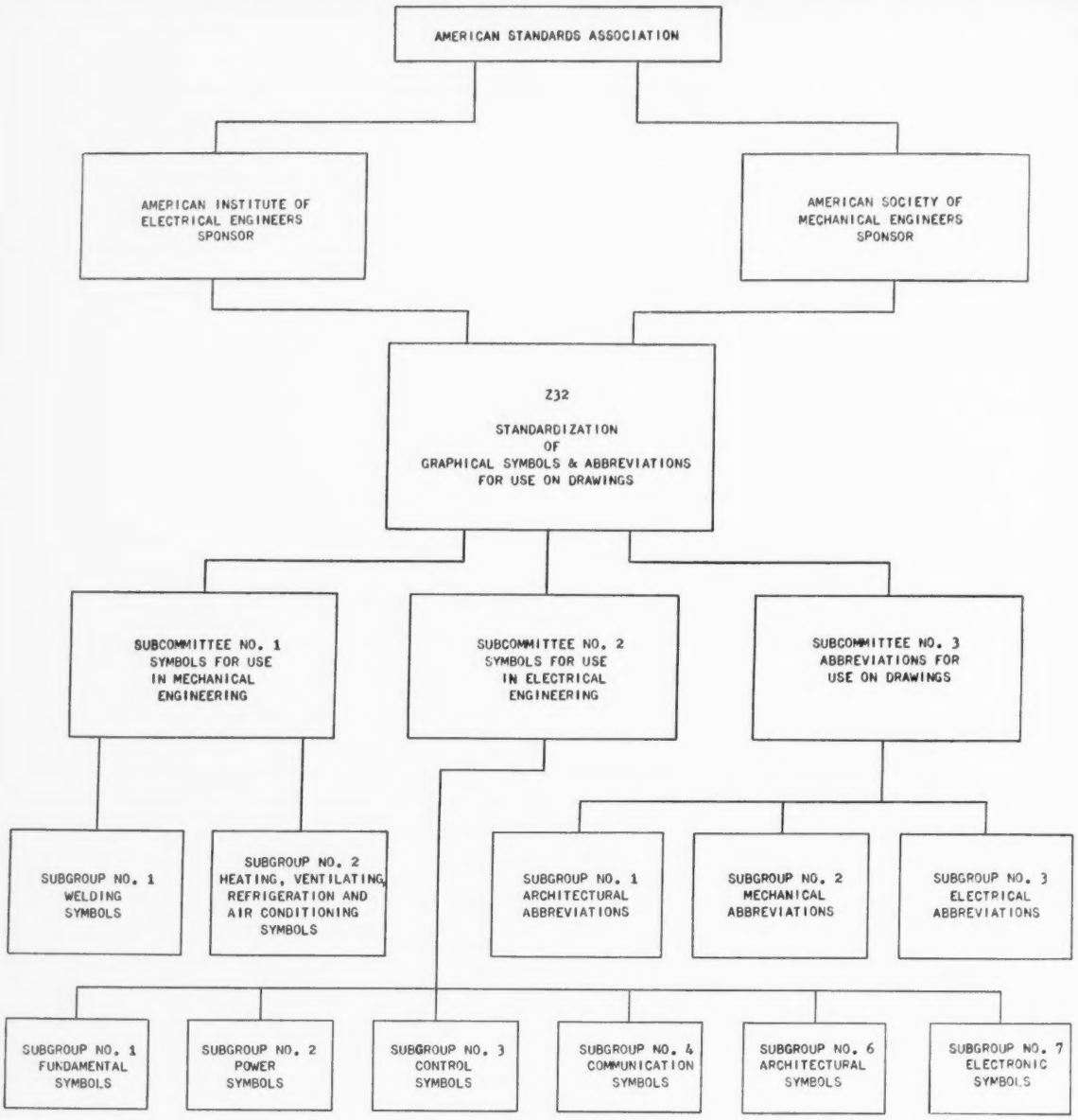
Graphical Symbols for Power, Control, and Measurement Z32.3-1943 40¢
Graphical Symbols for Telephone, Telegraph, and Radio Use Z32.5-1942 30¢
Graphical Electrical Symbols for Architectural Plans Z32.9-1943 20¢
American War Standard Coordination of Electrical Graphical Symbols Z32.11-1944 10¢

The organization of the standardization work on graphical symbols of Committee Z32 is shown on page 96.

Standardization Is Feature of Management Course

One of the features of the sixth Annual Management Course which will be held from June 12 to June 30 by the University of Iowa, College of Engineering, is a session on standard methods and standard time values. The session will be conducted by Harold Engstrom, Supervisor of Standards with Bendix Radio. Since standardization of methods, tools, and equipment must precede the installation of any successful wage incentive system, considerable time is devoted to the discussion of this system in the course. The entire course will be devoted to production planning, plan layout, motion and time study, wage incentives, and related subjects. The course is intended for plant managers, foremen, industrial engineers, methods and time study analysts, cost accountants, and office executives.

How the Work on Standardization of Graphical Symbols Is Organized


AMERICAN STANDARDS ASSOCIATION
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS SPONSOR
AMERICAN SOCIETY OF MECHANICAL ENGINEERS SPONSOR
Z32
STANDARDIZATION OF GRAPHICAL SYMBOLS & ABBREVIATIONS FOR USE ON DRAWINGS
SUBCOMMITTEE NO. 1 SYMBOLS FOR USE IN MECHANICAL ENGINEERING
SUBCOMMITTEE NO. 2 SYMBOLS FOR USE IN ELECTRICAL ENGINEERING
SUBCOMMITTEE NO. 3 ABBREVIATIONS FOR USE ON DRAWINGS
SUBGROUP NO. 1 WELDING SYMBOLS
SUBGROUP NO. 2 HEATING, VENTILATING, REFRIGERATION AND AIR CONDITIONING SYMBOLS
SUBGROUP NO. 1 ARCHITECTURAL ABBREVIATIONS
SUBGROUP NO. 2 MECHANICAL ABBREVIATIONS
SUBGROUP NO. 3 ELECTRICAL ABBREVIATIONS
SUBGROUP NO. 1 FUNDAMENTAL SYMBOLS
SUBGROUP NO. 2 POWER SYMBOLS
SUBGROUP NO. 3 CONTROL SYMBOLS
SUBGROUP NO. 4 COMMUNICATION SYMBOLS
SUBGROUP NO. 6 ARCHITECTURAL SYMBOLS
SUBGROUP NO. 7 ELECTRONIC SYMBOLS

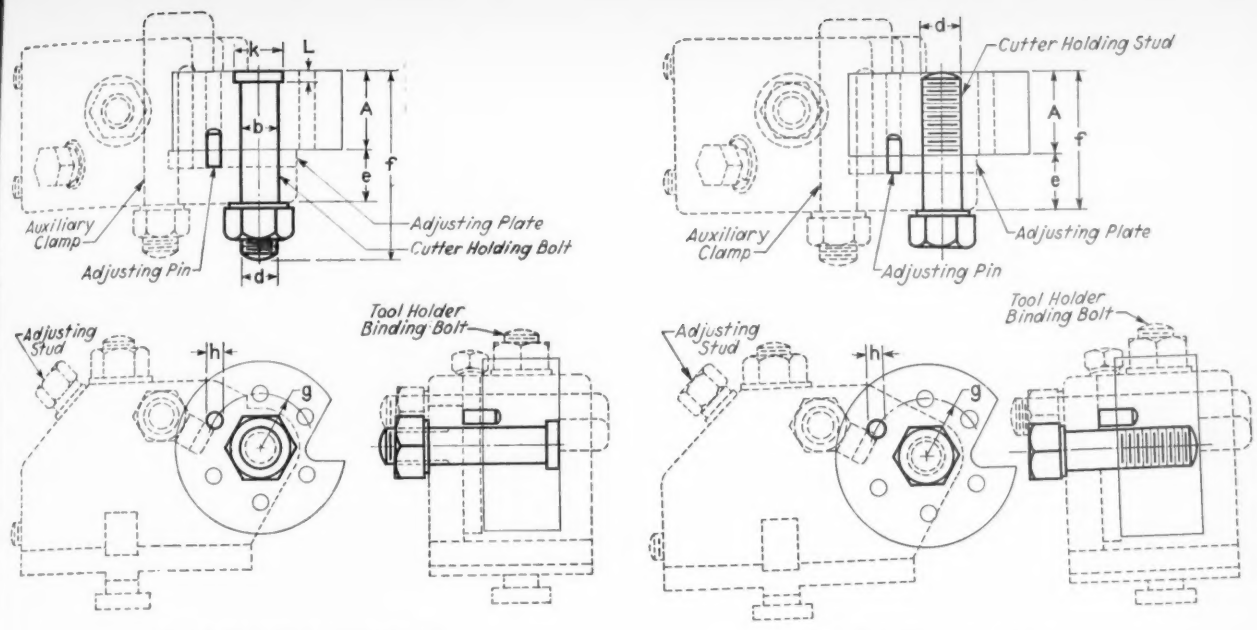
New ASTM Committee on Metal Powders

A new committee on Metal Powder Products, ASTM B-9, has been organized by the American Society for Testing Materials to set up specifications and methods of test for these materials. Technical representatives of leading producers and consumers are serving on the committee and its subgroups, with W. A. Reich, General Electric Company, as chairman, and W. R. Toeplitz, Bound Brook Oil-less Bearing Company, as secretary.

The need for a committee was felt when a number of suggestions to extend its technical activities to cover the increasing use of metal powder products were received by ASTM in the last year or two. Following the Symposium on Powder Metallurgy in March, 1943, there was an increased demand. The committee held its organization meeting in February, 1944.

The new committee will immediately consider adequate tests and methods of evaluating essential properties of powders and compacts. Three subcommittees have been organized with the following chairmen:

Nomenclature—F. N. Rhines, Carnegie Institute of Technology
Metal Powders—D. O. Noel, Metals Disintegrating Company
Metal Powder Products—R. P. Koehring, Moraine Products Division, General Motors Corporation



With Counterbored Hole

Machine Group Number	Width of Blank A	Bolt					Adjusting Pin		Tool Post e
		Length f	Thread d	Body b	Head k	L	Radius g	Diameter h	
	½	2½	¾–10	0.749	1	¼	15/16	0.248	1⅛
	¾	2¾	¾–10	0.749	1	¼	15/16	0.248	1⅛
4	1	2¾	¾–10	0.749	1	¼	15/16	0.248	1⅛
	1½	3½	¾–10	0.749	1	¼	15/16	0.248	1⅛
	2	3½	¾–10	0.749	1	¼	15/16	0.248	1⅛
	2½	3½	¾–10	0.749	1	¼	15/16	0.248	1⅛

With Threaded Hole

Machine Group Number	Width of Blank A	Bolt		Adjusting Pin		Tool Post e
		Length f	Thread Size d	Radius g	Diameter h	
	⅜	1⅛	½–13	11/16	0.185	¾
	½	1¼	½–13	11/16	0.185	¾
2	¾	1½	½–13	11/16	0.185	¾
	1	1¾	½–13	11/16	0.185	¾
	1¼	2	½–13	11/16	0.185	¾

Typical Circular Forming-Tool Holders

Revised American Standard Provides Mountings for Forming-Tool Blanks

by W. C. Mueller[1]

Chairman, Technical Committee 10, ASA Sectional Committee on Standardization of Small Tools and Machine Tool Elements

THE revised edition of the American Standard on Circular and Dovetailed Forming-Tool Blanks, approved recently by the American Standards Association as B5.7-1943, was prepared by an ASA technical committee under the sponsorship of the American Society of Mechanical Engineers, the National Machine Tool Builders' Association, and the Society of Automotive Engineers. The new edition includes tool-blank holders as well as provisions for the tool blanks themselves.

The first edition of the standard, on which work was started in 1931, was approved by the American Standards Association in 1936. The main purpose was to establish interchangeability and to reduce the number of different sizes and types of blanks used in making tools for the various screw machines of similar capacities. In order to accomplish this purpose and to cover the range of requirements for forming-tool blanks, the machines were classified into six groups, and an adequate number of blanks was provided for each group.

Prior to the acceptance of this standard by the various screw-machine manufacturers, they had sponsored designs and holding elements for forming tools intended to be used only on their particular machines. For this reason, a user who had several different makes of screw machines in operation was often faced with an unnecessarily high tool investment because he had to provide duplicate forming tools made to fit the respective tool holders. With the adoption of standardized blanks, it became evident that, in order to realize their full benefit and get them into general use, the mounting

[1] Manufacturing Engineer, Western Electric Company, Inc., Hawthorne Plant, Chicago, Ill.

Classification of Machines for Circular and Dovetailed Tools

Machines in Groups 2 and 4, only, are shown below. Six groups are given in the American Standard.

Group Number	Type of Machine	Maximum Capacity
2	3/8 Gridley	3/8
	1/2 Davenport	7/8
	9/16 Acme Gridley	9/16
	No. 0 Brown & Sharpe	5/8
	5/8 Cleveland	3/4
	5/8 × 7/8 Cleveland	1 1/16
	No. 204 New Britain	5/8
	7/8 Greenlee	1
	7/8 × 1 1/4 Cleveland	7/8
4	1 5/8 Gridley	1 5/8
	1 5/8 Acme Gridley	1 5/8
	No. 206 New Britain	1 5/8
	No. 415 New Britain	1 5/8
	No. 410 New Britain	...
	1 3/4 Gridley	1 3/4
	1 3/4 Greenlee	1 3/4
	No. 4 Brown & Sharpe	1 7/8
	2 Greenlee	2
	2 Gridley	2
	2 Cleveland	2 1/2
	2 × 2 3/4 Cleveland	3 1/4
	2 1/4 Cleveland	2 1/2
	2 1/4 × 2 3/4 Cleveland	3 1/4
	2 1/4 Gridley	2 1/4
	2 1/4 Greenlee	2 1/4

and clamping elements should likewise be standardized.

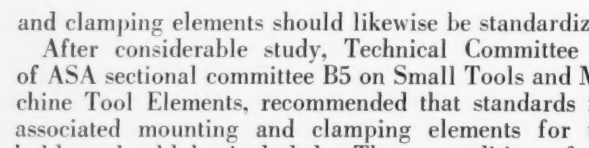
After considerable study, Technical Committee 10 of ASA sectional committee B5 on Small Tools and Machine Tool Elements, recommended that standards for associated mounting and clamping elements for the holders should be included. The new edition of the standard, therefore, in addition to specifying a definite size of tool blank for each machine group, also provides suitable mounting and clamping devices. Group numbers identify the sizes of tool blanks with the machines for which they are intended.

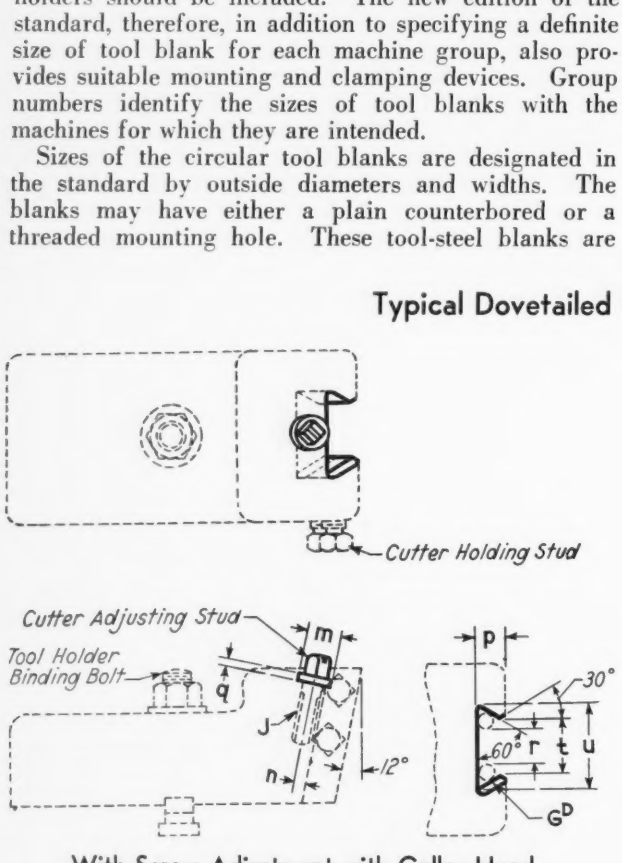
Sizes of the circular tool blanks are designated in the standard by outside diameters and widths. The blanks may have either a plain counterbored or a threaded mounting hole. These tool-steel blanks are used for making forming, cut-off, and chamfering tools by machining the periphery of the blank to the desired form. A notch of suitable depth is ground in the periphery of circular-form tools to provide the cutting edge of the forming tool.

The dovetailed forming-tool blanks are provided in a number of basic sizes as to width and thickness, depending on the group of machines for which they are intended. These tool-steel blanks are used for making forming tools by machining the desired form in the blank opposite and parallel to the dovetailed portion of the blank.

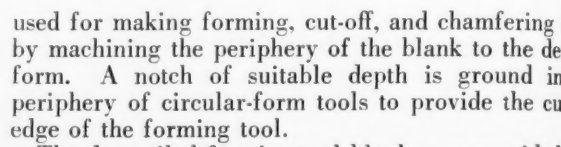
In preparing the data on holding elements for the new edition of the standard, Technical Committee 10 obtained the approval of the leading screw-machine

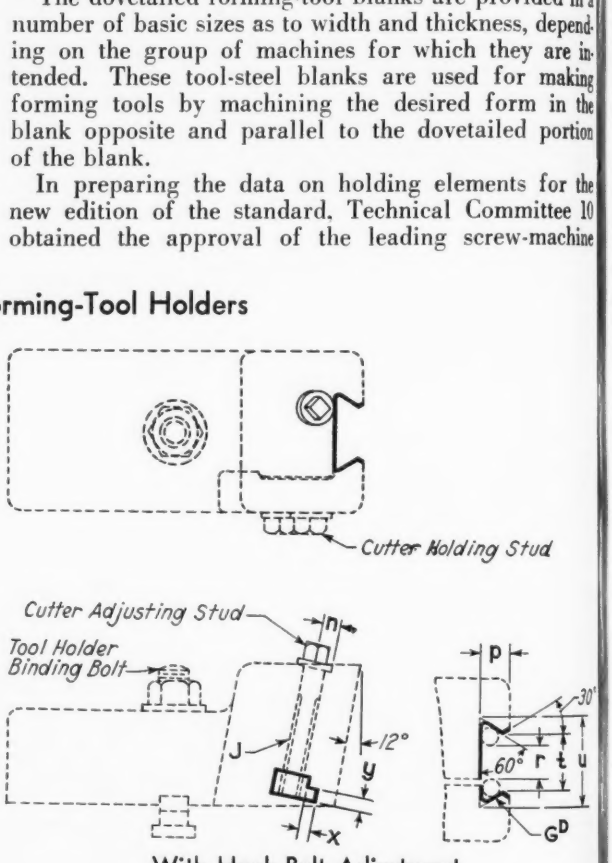
Typical Dovetailed Forming-Tool Holders





With Screw Adjustment with Collar Head





With Hook Bolt Adjustment

Dimensions for Dovetailed Forming-Tool Holders with Hook-Bolt Adjustment for Group 2 and 4 Machines

Machine Group Number	Dovetail					Screw Location	Adjusting Stud and Nut		
	Bottom Width u	Thickness p	Between Plugs r	Plug Diameter GD	Top Width t	n	Length of Toe x	Thickness of Toe y	Thread Size J
2	0.897	25/64	0.214	1/4	29/64	1/4	3/16	3/16	5/16-24
4	1.790	21/32	0.766	3/8	1 11/64	9/32	1/4	1/4	3/8-24

manufacturers who cooperated in the preparation of the original standard for forming-tool blanks.[2]

The committee is anxious to continue to keep abreast of progress and to include as many makes of machines in this standard as possible. It stands ready, therefore, to consider wider application of the standardized forming-tool blanks by listing additional makes of machines in the standard when manufacturers of such machines signify an interest in adopting the standardized blanks.

New and improved designs of clamping members will likewise be given due consideration. In this connection, one of the most important phases in any standardization program is putting it into use. The committee earnestly suggests, therefore, that the users of screw-machine forming-tool blanks incorporate the American Standard for Circular and Dovetailed Forming-Tool Blanks (B5.7-1943) in their specifications for such screw-machine equipment.

At the time this revised standard was going to press, a suggestion was received that wider dovetails be standardized for heavy work and for machining of hard materials. This is a recent development brought about by war work, and indicates a need for further standards. Because of this apparent need the committee has this matter under consideration with the thought that it may recommend additional data on dovetailed tools.

Swiss Standards Secretary Dies

The American Standards Association has been informed that H. Zollinger, secretary of the Swiss Standards Association, died recently after a brief illness. Mr. Zollinger had been the executive head of the Swiss body since its organization in 1918, and had taken a major part in the development of the national standardization work in his country.

He also played an important role in building up international cooperation in standardization. From 1923 until 1926, when the International Standards Association was organized, the Swiss national standards association functioned as an informal international secretariat to promote the unification of national standards in different countries. This involved the exchange, through Mr. Zollinger's office, of quarterly progress reports, submitted by all national standardizing bodies.

After the organization of the International Standards Association, Mr. Zollinger personally took part in several of the ISA projects. Among these was the project on tolerances. Mr. Zollinger was one of the Swiss members of ISA Technical Committee 3 which developed the ISA System of Tolerances, now adopted by all industrial countries of Europe.

Since the Swiss Standards Association, of which Mr. Zollinger was secretary, was organized in the same year as the American Standards Association (1918), there has been a long record of friendly and active cooperation between the two organizations.

British Gas Appliance Standards

The British Standards Institution, at the request of the Ministry of Works, has formed a Technical Committee for the preparation of British Standards for gas appliances used in low-cost housing—the completed standards to be available by May 31, 1944. The committee is representative of the Institution of Gas Engineers, the National Gas Council, the British Commercial Gas Association, the Society of British Gas Industries, and the Ministry of Works.

—From "The Gas World", March 18, 1944

[2] This included all but one of the country's leading screw-machine manufacturers at the time the original standard was approved. Since then, other machinery manufacturers may have entered the screw-machine field.

The American Standard, Circular and Dovetailed Forming-Tool Blanks, B5.7-1943, is one of a series of standards for small tool and machine-tool elements being prepared by ASA sectional committee B5, working under the sponsorship of the American Society of Mechanical Engineers, the National Machine Tool Builders' Association, and the Society of Automotive Engineers. Eighteen standards have already been completed under this program.

Members of Technical Committee 10 on Forming Tools and Holders which prepared the revised standard are:

W. C. Mueller, Western Electric Company, *Chairman.*

William L. Barth, Standards Section, General Motors Corporation, Detroit, Michigan.
W. E. Blank, National Cash Register Company, Dayton, Ohio
C. H. Borneman, Supervisor, Tool and Gage Department, General Electric Company, Schenectady, New York.
C. D. Carter, Planning Standards, Western Electric Company, Hawthorne Plant, Chicago, Illinois
A. E. Drissner, Vice-President, National Acme Company, Cleveland, Ohio
E. E. Griffiths, Director, Time Study and Methods Department, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pennsylvania
R. E. Kilgore, N. A. Woodworth Company, Ferndale, Michigan
William P. Michell, Factory Manager, International Motor Company, Mack Plant, Allentown, Pennsylvania
D. H. Montgomery, vice-president, The New Britain-Gridley Machine Company, New Britain, Connecticut
L. D. Spence, Charge Tool Designing, Brown & Sharpe Manufacturing Company, Providence, Rhode Island

The definitions for this standard were prepared in collaboration with Technical Committee 17 on Nomenclature of which O. W. Boston is chairman.

Copies of the American Standard Circular and Dovetailed Forming Tool Blanks, B5.7-1943, may be obtained from the American Standards Association at 50 cents per copy. ASA Members are entitled to 20 percent discount on all approved standards ordered from the American Standards Association.

Emergency Steel Specifications Conserve Scarce Metals

USE of the National Emergency Steel Specifications, set up in 1941 to stretch the supply of critical alloy metals, led in 1943 to a saving of approximately 24,000 tons of that scarce war material —nickel, the American Iron and Steel Institute states in a recent issue of *Steel Facts*. Before the drafting of these specificaations, many typical alloy steels contained a large proportion of only one or two alloys, instead of small amounts of several, and the chief alloy used to toughen steel was produced according to the NE specifications, which provide for a reduced use of critical nickel, offset by the use of carefully controlled amounts of chromium and molybdenum.

There is a further conservation feature to the steels developed in accordance with these specifications. Although they do use slightly greater amounts of molybdenum and manganese than the regular grades of steel, they are specially designed, unlike the regular grades, to make full use of the quantities of alloying metals—nickel, chromium, molybdenum—present in the steel scrap that goes into their manufacture. In 1943, steel made to NE specifications used about 10,000 tons of nickel, 6,000 tons of chromium, and 2,000 tons of molybdenum—all recovered from scrap.

The program that produced the selected list of steel specifications, known as the National Emergency Steel Specifications was organized in 1941. At that time it became apparent that during the emergency an increased amount of steel would have to be produced from existing facilities, and that one means to assure this was to reduce the innumerable steel specifications to a working minimum. For this purpose, an Administrative Committee, now under the supervision of the Conservation Division of the War Production Board, was organized. This committee was made up of representatives of the American Society for Testing Materials, the Society of Automotive Engineers, and the American Iron and Steel Institute, with the collaboration of the War and Navy Departments, and advisors from other interested organizations. The work was then, and is now, headed by C. L. Warwick, Chief of the Special Consultants Staff of the Conservation Division of the WPB and Secretary of the ASTM.

The steels made from these specifications have stood quality and performance tests in actual use, and are in many instances considered as fine as those they replaced, the American Iron and Steel Institute declares important users have reported.

Safety Standard Proposed for Conveyors

A proposed American Standard Safety Code for Conveyors and Conveying Machinery is being circulated for review and comment by the National Conservation Bureau and the American Society of Mechanical Engineers, sponsors for ASA project B20. The suggestions received will form the basis for a final revision of the proposed standard before it is submitted to the members of the sectional committee, the sponsor organizations, and the American Standards Association for final approval and publication.

Although the use of mechanical conveyors in many industries has eliminated a large proportion of the accident hazards resulting from the manual handling of materials, it has at the same time introduced new hazards. Many of these hazards can be eliminated by a more general agreement among both manufacturers and users of conveying equipment as to safe practice in the manufacture, installation, and operation of such equipment, the introduction to the proposed standard points out. The document is designed to serve as a guide to state authorities in the formulation of state safety rules and regulations and also for voluntary use by concerns manufacturing or using conveyor machinery and equipment.

The Sectional Committee on the Safety Code for Conveyors and Conveying Machinery, B20, would like to have all suggestions for corrections or additions as soon as possible. Comments should be addressed to C. B. LePage, Assistant Secretary, American Society of Mechanical Engineers, 29 West 39 Street, New York 18, N. Y.

ASA Safety Engineer Speaks on Compiling Accident Facts

An interesting discussion of a sometimes neglected aspect of accident prevention work was presented by Henry G. Lamb, Safety Engineer of the American Standards Association, who spoke on "Compiling the Facts" at the Fifteenth Annual Convention and Exposition of the Greater New York Safety Council March 29. Mr. Lamb referred to the importance of a proper compilation of the facts shown in accident reports, and showed how fundamental an accurate compilation may be in directing the policies of a sound safety program. He further discussed the cause classification method of reporting accident information, as set forth in the American Recommended Practice for Compiling Industrial Accident Causes, Z16.2-1941, and discussed the mechanical and technical features of its proper administration. The ASA committee in charge of this Code has received much useful information from organizations that have used it, he said, and will welcome additional observations for use in future editions.

Mr. Lamb spoke at a session on Fundamental Causes of Accidents. His talk was preceded by two discussions of the problem of finding the facts in accident work. Wm. H. Hollis, Safety Training Supervisor of the Sperry Gyroscope plant at Lake Success, New York, spoke on "Finding the Facts—Mechanical and Material Causes"; and "Finding the Facts—Human Causes" was treated by Ralph J. Crosby, Safety Director of Marsh and McLennan, Inc. The session was concluded with "Use of the Facts—Selling Management," presented by Dr. Walter Cutter, Administrative Assistant, Center for Safety Education, New York University.

Standards Issued by Associations and Government

(For new American Standards see page 105)

For the information of ASA Members, the American Standards Association gives here a list of standards received by the ASA Library during the last month. The list given below includes only those standards which the ASA believes are of greatest interest to Members in connection with their war production problems.

These standards may be consulted by ASA Members at the ASA Library, or copies may be obtained from the organization issuing the standard. The address of the organization is given for your convenience.

Associations and Technical Societies

American Society for Testing Materials (260 South Broad Street, Philadelphia 2, Pa.)

The letter T following a designation indicates the standard is Tentative. Where an additional number appears within parentheses, it indicates there is an Emergency Alternate Provision attached to the standard.

ASTM Thermometers, Tentative Specifications for E1-44T 25¢
Flammability of Plastics, Self-Extinguishing Type D757-44T 25¢
Impact Resistance of Plastics at Subnormal and Supernormal Temperatures, Tentative Method of Test for D758-44T 25¢
Resistance of Plastics to Accelerated Service Conditions, Tentative Methods of Test for D756-44T 25¢
Tensile and Compressive Properties of Plastics at Subnormal and Supernormal Temperatures, Tentative Methods of Test for D759-44T 25¢
Changes in Protective Properties of Organic Coatings on Steel Surfaces when Subjected to Immersions, Emergency Method of Test for ES-35 25¢

Institute of Radio Engineers (330 West 42nd Street, New York 18, N. Y.)

Facsimile, Temporary Test Standards on 1944 20¢

Society of Automotive Engineers, Inc. (29 West 39 Street, New York 18, N. Y.)

Aeronautical Material Specifications

Aluminum Bronze Castings, As Cast AMS 4870
Bronze Castings AMS 4845B (Revision of 12/5/39)
Compound, Anti-seize (White Lead Base) AMS 3080A (Revision of 6/13/40)
Compound, Insulating and Sealing AMS 3087
Gaskets, Oil Resisting, Synthetic Rubber Binder AMS 3231
Manganese Bronze Castings, High Strength AMS 4862A (Revision of 3/1/42)
Pearlitic Malleable Iron Castings AMS 5310
Steel, 3 Ni 1 Cr .1 Mo (.08 — .13 C) AMS 6260A (Revision of 9/1/42)
Steel, 3 Ni 1 Cr. .1 Mo (.08 — .13 C) AMS 6262A (Revision of 9/1/42)
Steel, 3 Ni 1 Cr .1 Mo (.09 — .14 C) AMS 6263A (Revision of 9/1/42)
Steel, 3 Ni 1 Cr .1 Mo (.15 — .20 C) AMS 6264A (Revision of 9/1/42)
Steel-Carburizing, Nickel Chromium AMS 6253D (Revision of 6/13/40)
Steel Sheet and Strip, Low Carbon AMS 5040C (Revision of 3/13/40)

U. S. Government

(Wherever a price is indicated, the publication may be secured from the Superintendent of Documents, Government Printing Office, Washington, D. C. In other cases, copies may be obtained from the government agency concerned.)

National Bureau of Standards (Washington, D. C.)

Simplified Practice Recommendations

Loaded Paper Shot Shells, Simplified Practice Recommendation R31-44 (supersedes R31-39) January 2, 1944 5¢
Paints, Varnishes, and Related Products (Colors and Containers), Simplified Practice Recommendation R144-43 (supersedes R144-42) December 15, 1943

U. S. Department of Labor, Division of Labor Standards (Washington, D. C.)

Safety Subjects, Bulletin 67, January, 1944

Federal Specifications Executive Committee (U. S. Treasury Department, Washington, D. C.)

Federal Specifications

Copies available from Superintendent of Documents, Government Printing Office, Washington, D. C.)

Bandages:
rubber (Amendment 2) ZZ-B-101 May 15, 1944
suspensory, cotton JJ-B-111 May 15, 1944

Federal Specifications—(Continued)

Brushes:
sanitary or toilet (Amendment 1) H-B-481 May 15, 1944
window (Amendment 1) (superseding E-H-B-751, 3/31/42) H-B-751 May 1, 1944

Cable and wire; rubber-insulated, building-type (0 to 5,000-volt service) (Amendment 2) J-C-103 May 1, 1944

Calcium-carbide (Amendment 2) O-O-101 May 15, 1944

Calcium-chloride; hydrated, technical-grade (superseding O-C-106) O-C-106a April 15, 1944

Felt: hair (superseding C-F-201b and E-C-F-201b, 12/17/42) C-F-201c May 15, 1944

Fuses:
cartridge, inclosed, renewable (fusible links not separately inclosed); and renewal-links therefor (Amendment 3) (superseding Amendment 2 and E-W-F-803a, 4/3/43) W-F-803a May 1, 1944
cartridge, inclosed, renewable (fusible links separately inclosed) (Amendment 4) (superseding E-W-F-805, 4/3/43) W-F-805 May 1, 1944

Gaskets: asbestos, metallic-cloth (superseding HH-G-76 and E-HH-G-76, 2/20/43) HH-G-76a May 15, 1944

Hose:
fire; cotton, rubber-lined (Amendment 1) (superseding E-ZZ-H-451a, 9/10/42) ZZ-H-451a May 15, 1944

Hose—(Continued)
steam (Amendment 2) (superseding Amendment 1 and E-ZZ-H-541, 11/13/42)
suction, water, smooth-bore (Amendment 2) (superseding Amendment 1 and E-ZZ-H-561b, 5/14/43) ZZ-H-561b May 15, 1944
Jacks (Amendment 1) GGG-J-51a May 1, 1944
Lint; absorbent DDD-L-427 May 15, 1944
Packing:
asbestos, metallic-cloth, sheet, and tape (superseding HH-P-31 and E-HH-P-112) HH-P-31a May 15, 1944
asbestos, rod, high-pressure (superseding HH-P-36, and E-HH-P-36, 2/20/43) HH-P-36a May 15, 1944
hydraulic (superseding HH-P-171) HH-P-171a May 15, 1944
semimetallic (superseding HH-P-166 and E-HH-P-166, 4/21/42) HH-P-166a May 1, 1944
spiral, gland, low-pressure (superseding HH-P-171) HH-P-171a May 15, 1944
Paint:
enamel; drum-coating, exterior, rust-inhibiting, solvent-resistant TT-E-485 May 15, 1944
lithopone; dry (paint-pigment) TT-L-426 May 15, 1944
oil; linseed-replacement (for thinning paints and pastes in oil) (Amendment 1) TT-O-371 May 15, 1944
Pans; fry, steel (Amendment 1) RR-P-89 May 15, 1944
Paper:
boxes; powder, pharmaceutical (Amendment 1) UU-B-666 May 15, 1944
cards; guide, pressboard (file size) (superseding UU-C-96b, and E-UU-C-96b, 10/14/42) UU-C-96c May 15, 1944
cups; (superseding UU-C-806a and E-UU-C-806a, 7/20/43) UU-C-806b May 15, 1944
folders; file, pressboard (superseding UU-P-547b and E-UU-F-581b, 9/30/42) UU-F-581c May 15, 1944
Napkins; table (superseding UU-N-106) UU-N-106a May 15, 1944
sacks; shipping (Amendment 1) UU-S-48 May 15, 1944
tape; gummed (kraft) (superseding UU-T-111, 5/20/42 UU-T-111a May 15, 1944
teletype, roll and tape (superseding UU-P-547b and E-UU-P-547b, 2/25/43) UU-P-547c May 15, 1944
Rope:
jute (superseding E-T-R-601a [Class E], 2/20/43) T-R-5
May 15, 1944
sisal (Amendment 2) T-R-631 May 15, 1944
Rosin (Amendment 1) LLL-R-626 April 15, 1944
Soap:
low-titer (for low temperature washing) (Amendment 2
P-S-600 May 1, 1944
saddle (Amendment 1) P-S-609 May 1, 1944
Sodium-bicarbonate; technical grade O-S-576 May 15, 1944
Strapping:
flat; steel (Amendment 2) QQ-S-781a May 15, 194
round; steel, bare and zinc-coated QQ-S-790 May 15, 194
Switches:
snap, multiple-type and combination devices, flush type wit
wall plates (Amendment 3) W-S-893 May 1, 1944
snap, single-unit, interchangeable, flush-type with wall plate
(Amendment 3) W-S-896 May 1, 1944
Thinner; lacquer (Amendment 3) TT-T-266 May 1, 1944
Wheelbarrows (Amendment 3) KKK-W-291 May 1, 1944
Wrenches, bolt and nut; socket GGG-W-641 May 1, 1944

War Food Administration (Washington, D. C.)

Frozen Snap Beans, Tentative U. S. Standards for Grades
April 15, 1944

Army Air Forces (Washington, D. C.)

Material and Process Specifications, Bulletin No. 23 (supe
sedes issue of April 10, 1944) May 10, 1944

WPB Revises Emergency Specifications for Concrete Buildings

In order to increase the amount of reinforcing steel that may be used in concrete buildings, the National Emergency specifications for reinforced concrete buildings (War Production Board Directive 9) have been amended. The amendments will exempt small projects using less than five tons of steel and will do away with some of the paper-work requirements for the construction industry.

"The main purpose in amending Directive 9 is to ease the situation with respect to labor, transportation, and form lumber required in the erection of reinforced concrete buildings," Howard Coonley, director of the Conservation Division of the WPB, announced. The supply of steel is less critical now than at the time the original directive was issued in October, 1942, and it is possible to save about 10 percent in quantities of concrete, lumber, and labor, he said.

Since about five percent more reinforcing steel is permitted in reinforced concrete construction by the amendment of WPB Directive 9, this results in about 10 percent reduction in the size of concrete beams and columns. Thus, pre-war design practices in common use will again be established. The filing of a certificate declaring that the National Emergency Specifications for the Design of Reinforced Concrete Buildings have been followed will no longer be necessary.

Mr. Coonley explained that with reference to the technical details of designing, the amendment removes the former preferences given to the use of non-reinforced concrete or masonry in the construction of footings, walls, piers, retaining walls, and buttresses. It also removes the necessity for the use of extra deep members formerly required to save reinforcing steel. The extreme fibre stress in compression in flexural members has been increased from 0.35 to 0.45 of the ultimate strength of the concrete. The ratio of vertical reinforcement in spirally reinforced columns has been changed to permit a minimum of 0.01 and a maximum of 0.08. Similarly, the ratio of vertical reinforcement in tied reinforced columns has been changed to permit a minimum of 0.01 and a maximum of 0.04. However, the increased working stresses in reinforcing steel required by the original emergency specifications have not been modified in this amendment.

British Ask Comment On Standard Textile Terms

A recommended list of definitions for terms used in the textile industry has just been issued for criticism by the Textile Terms and Definitions Committee of the British Textile Institute. The list of recommended terms and definitions is published in the March, 1944 issue of the *Journal of the Textile Institute*. They will be reconsidered in the light of comments and criticisms before they are adopted in final form. The list includes definitions for such terms as "bleaching," "combing," "shoddy," "bast fibre," and "rayon."

May 1944

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(Must be returned by September 1, 1944)

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.....	A55.1-1944		Administrative Requirements for Building Codes	.35
.....	B38.1-1944		Method of Computing Food-Storage Volume and Shelf Area of Automatic Household Refrigerators	.20
.....	B38.2-1944		Test Procedures for Household Electric Refrigerators (Mechanically Operated)	.30
.....	C6.1-1944		Terminal Markings for Electrical Apparatus	1.00
.....	C19.1-1943	AIEE 15-1944	Industrial Control Apparatus	.50
.....	C59.1-1944	ASTM D 48-43T	Testing Molded Materials Used for Electrical Insulation, Methods of	.25
.....	C59.13-1944	ASTM D 229-43	Testing Sheet and Plate Materials Used in Electrical Insulation, Methods of	.25

(*Continued on next page*)

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New Projects Approved

Linemen's Rubber Protective Equipment

News of ASA Projects

Air Raid Protection—

A new project on Air Raid Protection, requested by the Office of Civilian Defense, has been authorized by the ASA. The tentative scope of the work has been defined as follows: "To evaluate information now available on protective construction against air raids and to develop principles based on this information: to indicate specific applications of these principles to new construction and to remodeling in order to minimize elements of danger and strengthen elements of safety; to revise recommendations periodically in the light of changing methods of attack and defense." An addition is being considered to include recommendations regarding wider spacing of buildings.

Building Code Requirements for Prefabrication—

Development of Building Code Requirements for Prefabrication by the committee on Administrative Requirements for Building Codes, A55, has been authorized by Standards Council.

Linemen's Rubber Protective Equipment (J6)—

A new ASA War Project has been authorized to develop specifications for Linemen's Rubber Protective Equipment, as the result of a request from the War Production Board. Specifications will be set for a minimum number of types, patterns, styles, and sizes of linemen's rubber protective equipment which provides safety for linemen against the dangers to which they are exposed in carrying on their work.

Machine Tool Electrical Standards (C74)—

The war committee on Machine Tool Electrical Standards (C74) is now voting on the approval of a revision of the 1942 edition of this American War Standard. The proposed revision consists of a change in requirements for circuit and control conductors to bring them in line with the National Electrical Code and also a change to provide for the use of American Standard Electrical Graphical Symbols (Z32.11-1944).

Protective Occupational (Safety) Clothing (L18)—

The subcommittee on leather, asbestos, woolen, and flame resistant clothing met on May 17 to review comments and criticisms received as a result of canvass. These considerations will be submitted to a ballot of the war committee. On March 31 a meeting was held by the committee on coated and impregnated fabrics to consider the first draft of a specification for a typical apron for protection against moderate exposure to acids and caustics. It was decided by the committee to give further consideration to the draft before it is sent out for comment.

Safety Code for Conveyors and Conveying Machinery (B20)—

A first draft of an American Standard is being circulated for review and comment to those concerned, and the sectional committee is asking that all suggested changes be sent in as soon as possible. The proposed standard will be revised in light of the suggestions before being submitted for final approval. (See article, page 100.)

Safety Standard for Bakery Equipment (Z50)—

A Subcommittee on Slicers, Dividers, Rounders, Moulders, and Proofers, held its first meeting May 5. Detailed suggestions made at the meeting are being written up and will be studied by the committee members.

Standards for Safety in Building Construction (A10)—

A proposed standard for safety to workers during construction, demolition, and repair of buildings has been submitted to the American Standards Association by the American Institute of Architects and the National Safety Council, joint sponsors. The standard is now before the Safety Code Correlating Committee for recommendations to the Standards Council.

Valid Certification (Z34)—

The sectional committee on valid certification, at a meeting May 12, voted that the proposed standard practice in Public Approval and Certification Procedures be sent to letter ballot of the committee in order to determine whether it should be published for a year's trial and criticism.

Women's Industrial Clothing (L17)—

At the request of the War Production Board and the Office of Price Administration work is being started on standards for women's industrial outer garments, to provide garments which will adequately protect women workers from exposure to cold and wet weather. A preliminary meeting has been held to consider what types of garments would be suitable and what the specifications should cover.

Canada Adopts Industrial Lighting Standard

The American Recommended Practice of Industrial Lighting, A11-1942, has been adopted for Canadian use by the Canadian Engineering Standards Association, as CESA Standard Z92-1943.

This standard was prepared by the Sectional Committee for the Code of Lighting Factories, Mills, and Other Work Places, under the sponsorship of the Illuminating Engineering Society, through the procedure of the American Standards Association.

Following approval of the standard by the Canadian Engineering Standards Association, it was endorsed by the Canadian Department of Labor and is being issued as a bulletin of the department to be distributed to production men in Canada. The text and illustrations of the book will be verbatim as issued by the Illuminating Engineering Society, with the exception of a few slight changes incorporated in footnotes to conform with special Canadian conditions, particularly in referring to the Canadian Electrical Code.

The preface to the CESA standard states the endorsement by the Canadian Department of Labor. It says in part:

"The Department of Labour of Canada welcomes the opportunity to make this pamphlet available to the provincial Departments of Labour, industrialists, workers, and to all who are interested in good lighting in industrial and commercial establishments in Canada. Inadequate illumination results in fatigue, ill health, accidents, spoilage of materials, and poor production records."

Inter-American Agreements To Speed Post-War Traffic

Development of standard specifications for length, width, height, and load of motor vehicles used in international traffic is proposed as one of the objectives of an international motor traffic convention which was signed by representatives of ten Latin-American countries at the Pan-American Union in Washington December 15. According to the Office of the Coordinator of Inter-American Affairs, the convention aims to facilitate the movement of motor vehicles among Western Hemisphere countries and to establish uniform rules to regulate international motor traffic on highways of the contracting nations.

The specifications would cover length, width, height, and load of vehicles admitted to international traffic, and would also include requirements as to equipment. The convention also provides for an international registration marker indicating the country of origin of a vehicle. It further stipulates that the contracting nations may require a special international automobile certificate and driving license for operators in international traffic.

Representatives of Bolivia, Brazil, the Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Nicaragua, and Peru have already signed the convention.

The governments of the 20 American republics which have not signed have been invited to do so. For the United States, Secretary of State Hull has indicated that he will approve the instrument as soon as he receives the necessary authorization. The Office of the Coordinator points out that should this convention be generally adopted by the Americas, nearly a million vehicles in these 20 countries would come under its provisions, and would benefit by the establishment of uniform rulings for international traffic.

AFL Lathers' Union Uses American Standard

American Standard building requirements are of interest to building authorities, construction companies, and insurance groups, and also, the American Standards Association has just learned, to members of at least one international labor union. The Wood, Wire and Metal Lathers International Union, AFL, has had the American Standard Specifications for Gypsum Plastering, Including Requirements for Lathing and Furring, A42.1, as part of its constitution since 1939. Although the union members comply with specifications provided by the architect, they are bound by their constitution to refuse to erect any work, whether it is specified or otherwise, which is below the requirements of this American Standard. Since the standard provides only minimum requirements, however, the use of materials or methods which are equivalent to or better than those provided in the standard is permitted. The union points out to its members that some types of structures may require metal lath and supporting members which are heavier than the minima listed in the standard specifications.

The American Standard was adopted by the International Executive Council of the union in December 1939 on instructions from the Eighteenth Convention of the union. This action binds union members in both the United States and Canada to comply with the specifications.

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American Standards for

Graphical Symbols for Electronic Devices

Z32.10—1944

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This standard coordinates the various graphical symbols for electronic devices used in drafting room practice throughout the country, adding new symbols where necessary. It covers the symbols used in home radio receivers and in many types of control equipment for both civilian and military use.

Developed by a widely representative committee under the leadership of the American Institute of Electrical Engineers and the American Society of Mechanical Engineers.

/WW

American War Standard

Coordination of Electrical Graphical Symbols

Z32.11—1944

10 cents per copy

This standard is a unification of the symbols used to indicate electrical circuits and equipment on engineering drawings. It represents a solution of a problem that has long been troubling engineers in the Power and Communication industries.

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